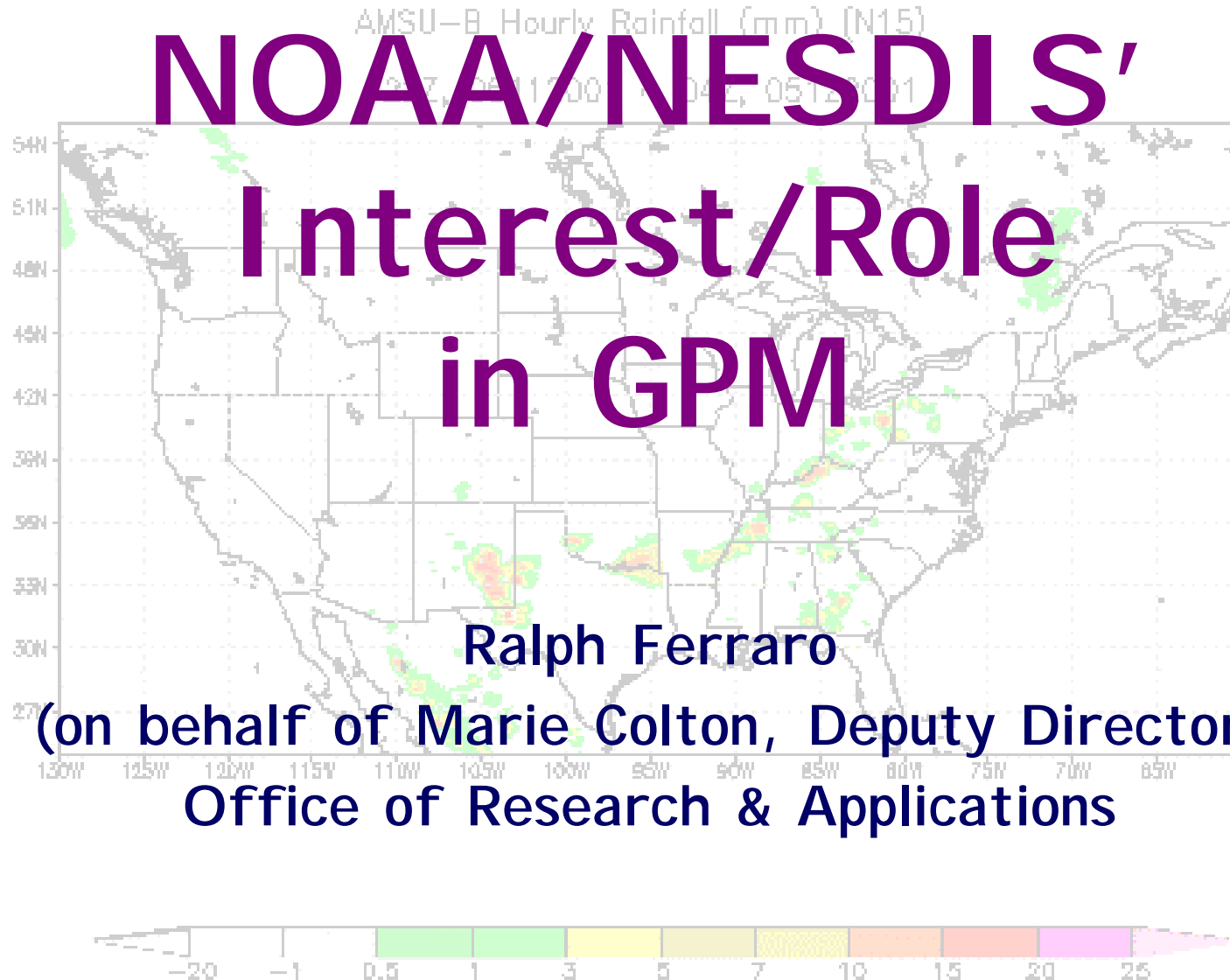


NOAA/NESDIS' Interest/Role in GPM

Ralph Ferraro

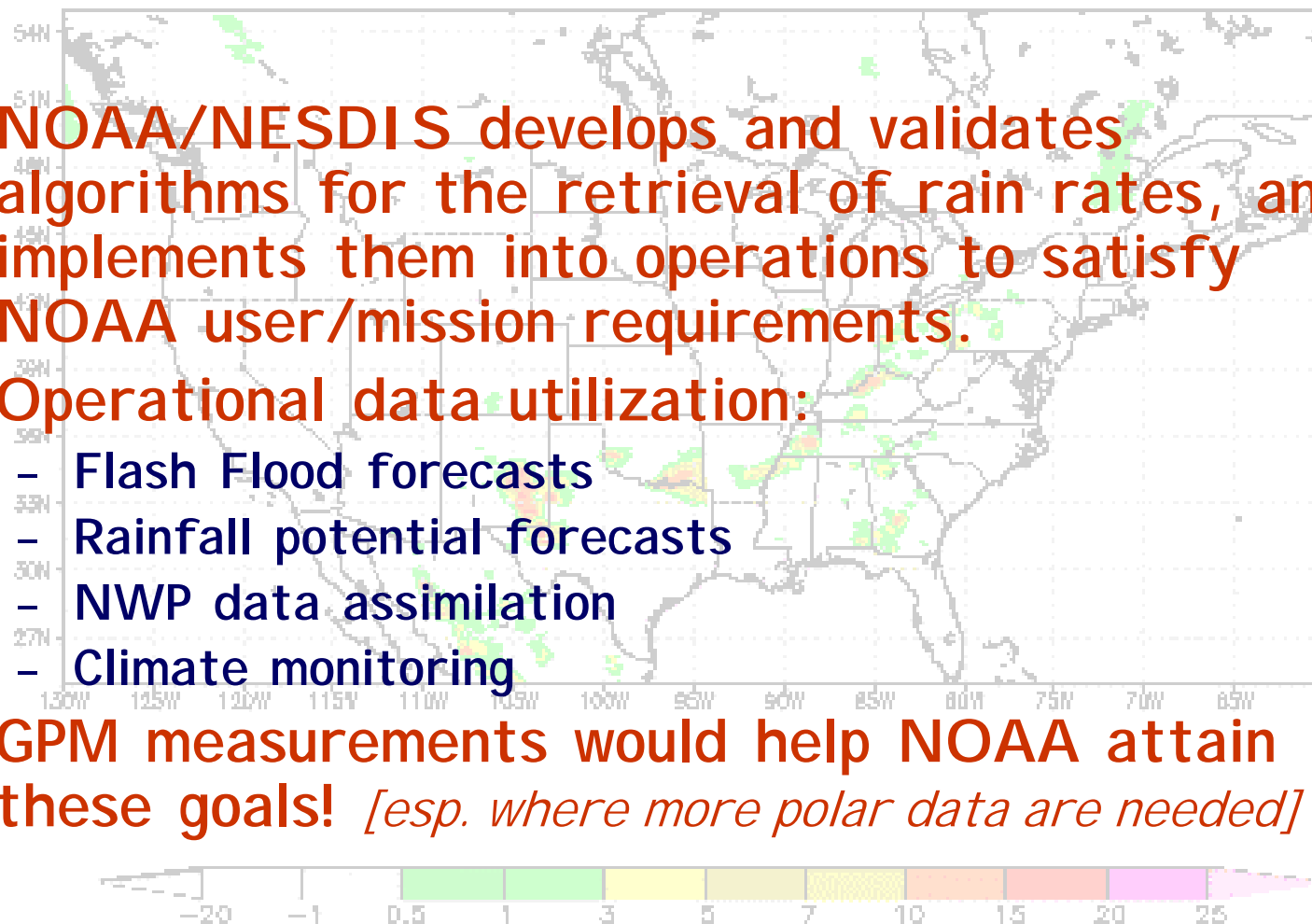
(on behalf of Marie Colton, Deputy Director)

Office of Research & Applications



Requirements as a User...

- NOAA/NESDIS develops and validates algorithms for the retrieval of rain rates, and implements them into operations to satisfy NOAA user/mission requirements.
- Operational data utilization:
 - Flash Flood forecasts
 - Rainfall potential forecasts
 - NWP data assimilation
 - Climate monitoring
- GPM measurements would help NOAA attain these goals! *[esp. where more polar data are needed]*



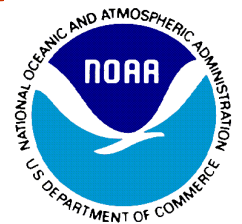
Example: Tropical Rainfall Potential (TRaP)

- **NCEP/TPC support:**

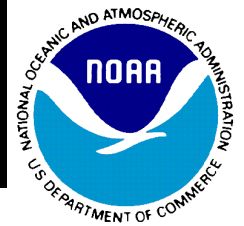
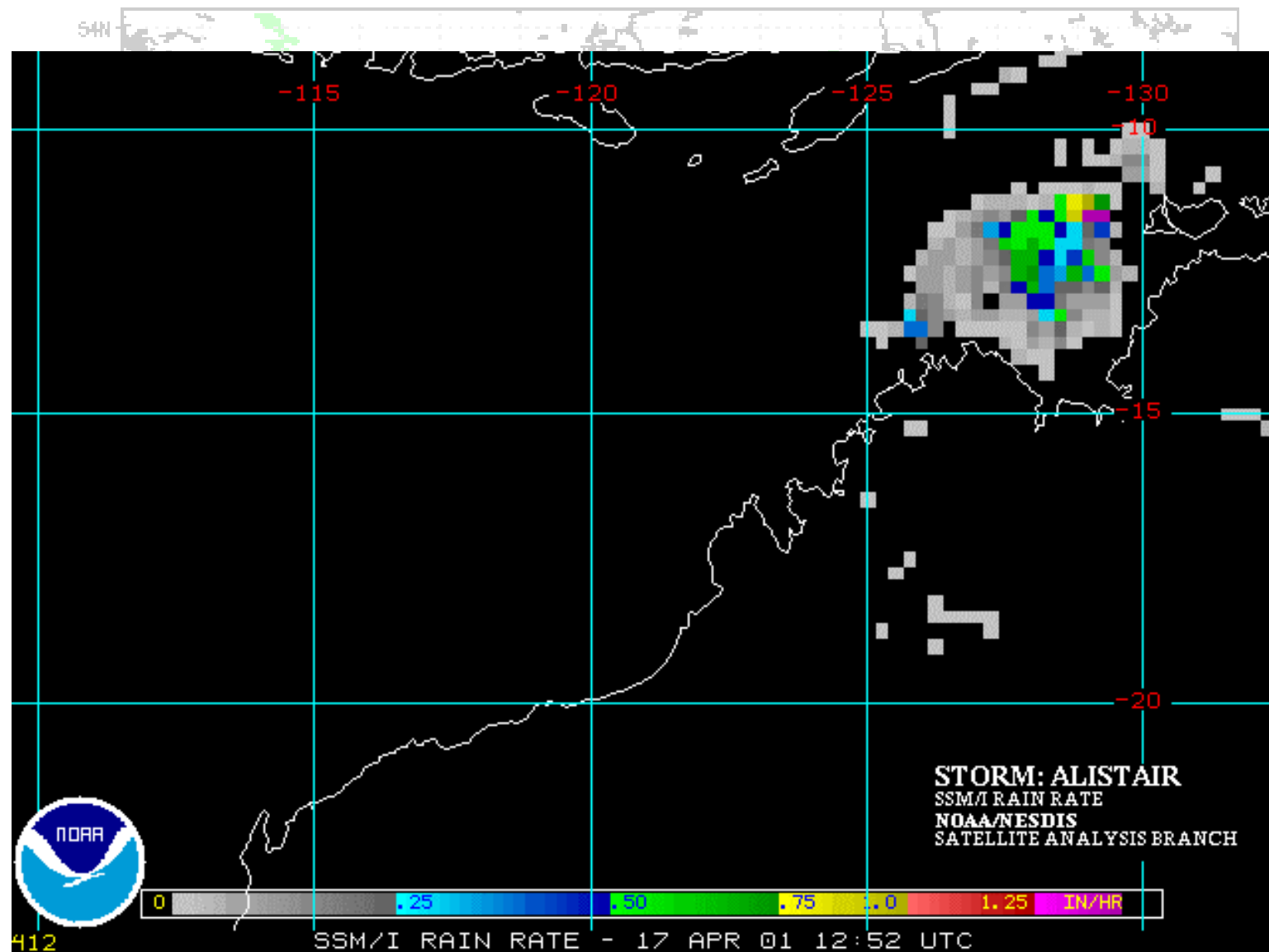
- All active tropical systems (global), 24-hours per day
- Assessment of rainfall potential (more than 12 hours from landfall):
 - How much (maximum)?
 - Where?
 - When?
- Being performed by a satellite meteorologist with other duties

- **Only objective method – Microwave derived estimates from SSM/I, TMI, and AMSU**

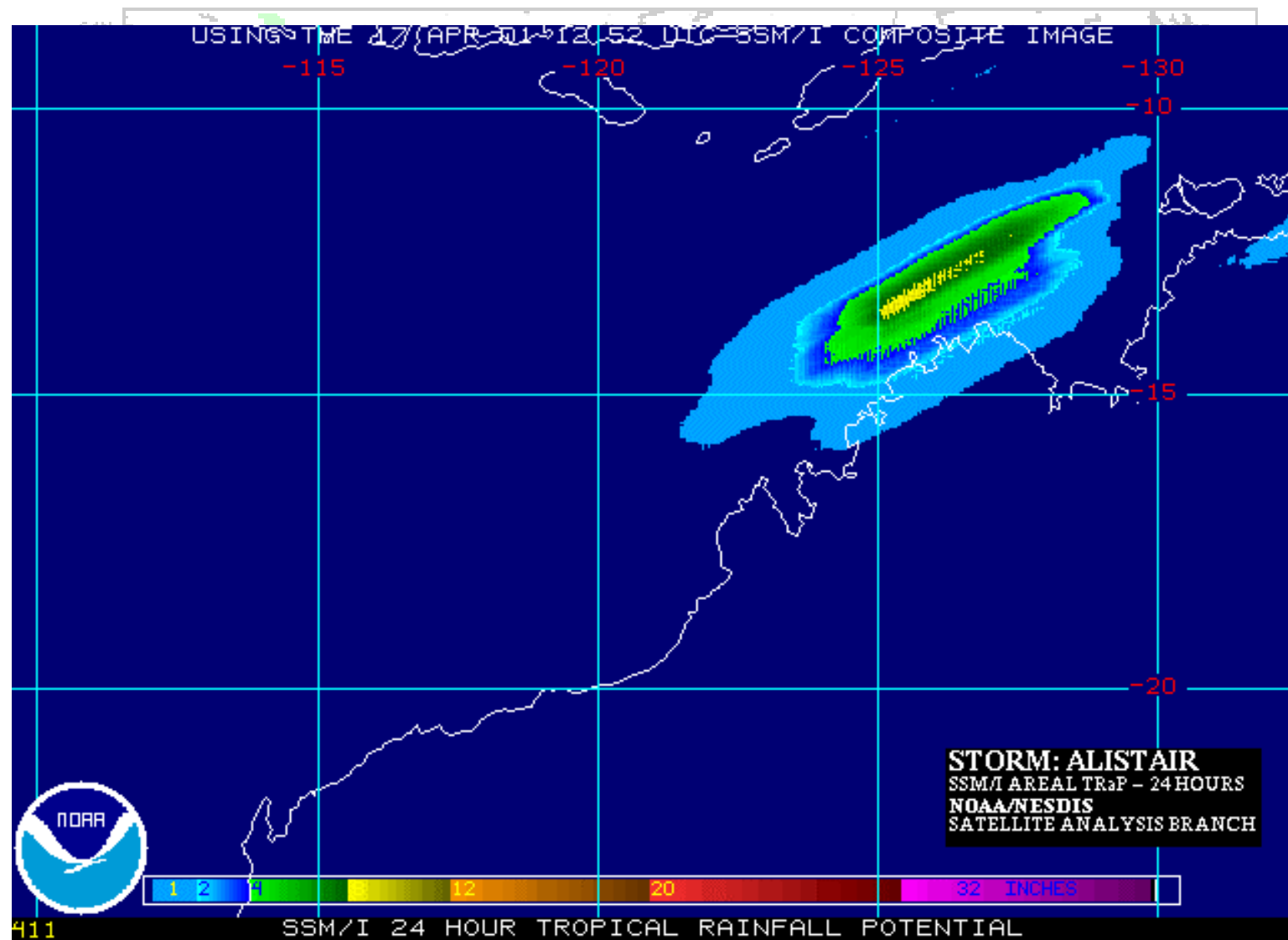
- **Current limitations are number of overpasses each day and orbital gaps; GPM will help!**



Example: Tropical Rainfall Potential (TRaP)



Example: Tropical Rainfall Potential (TRaP)



Example: West Coast U.S. Rainfall Potential

MSLP Hourly Rainfall (mm) (J05)
22Z, 05112001 ~ 04Z, 05122001

- **No direct measure of actual rain rate when systems are offshore:**

- Forecaster must assess realism of model first guess and forecast (location, intensity, etc.)

- **Satellites offer best estimate:**

- GOES – great temporal sampling, but systems can be warm top (poor physics)

- POES (MW) – better physics, but poor temporal; GPM will help!



ZCZC NFDSPENES ALL DDHHMM;390,1220 340,1190 340,1210 390,1240;
TTAA00 KNFD DDHHMM

SATELLITE PRECIPITATION ESTIMATES..DATE/TIME 2/8/98 1930Z
THE SATELLITE ANALYSIS BRANCH/NESDIS---NPPU--- TEL.301-763-8678
VALUES ARE MAX OR SGFNT EST. NO OROGRAPHIC CORRECTION UNLESS NOTED.
...EST'S FM: /GOES8-CNTRL AND E. U.S. / GOES9 - W. U.S...

REFER TO TPB#375 FOR DETAILS. **LATEST DATA USED: GOES-9 1900Z SJK
SSM/I 1710Z**

LOCATION... CNTRL CA/S CA...SEE GRAPHIC FOR AMTS...

**REMARKS FOR CA...LATER SSMI PASS AT 1710Z WIDTH OF RAIN BAND AVGING
ABOUT 1 DEG AND CNTRD FROM 32N/127W TO 35N/124W TO 37N/124W...
CURLING NWWD TO 38N/125W. GENERAL RAIN RATES CONTINUE BELOW 0.1"/HR
...HOWEVER THERE WERE SOME ISOLATED POCKETS OF NR 0.15"/HR AT
33.5N/125W (HEADING FOR SOUTHERN CA) AND 36N/124W AND 38N/125W HEADING
FOR CENTRAL AND N CA...THESE RATES ARE ABOUT THE SAME AS 14Z SSMI PASS
AND MUCH WEAKER/LOWER THAN YDYS STORM. NOT TOO MENTION ALSO THAT
700MB TRANSPORT WINDS ONLY BLOWING A SHT DISTANCE PARALLEL TO THE BEST
MOISTURE WITH FRONT...SO EVEN MORE REASON TO EXPECT QUICKER AND MUCH
LESS PRECIP BOTH NORTHERN TO CENTRAL CA NXT SEVERAL HRS AND SOUTHERN
CA LATER TODAY AND EVE...IN-HOUSE RAINFALL POTENTIAL USING SSMI RAIN
RATES GIVING UP TO 0.5" PER 6HRS OF NON OROGRAPHIC PRECIP.
LATEST GOES VIS SHOWING GOOD BURST IN S SAN MATEO COUNTY INTO
N SANTA CRUZ AND WILL BE AFFECTING SANTA CLARA NXT HR OR SO...THIS
GOOD BURST COULD GIVE UP TO 0.5"/HR AS IT MOVES BY...ADDITIONAL BURSTS
JUST OFFSHORE KMRY AND KSFO COULD GIVE LOCALLY HVY BUT RELATIVELY
BRIEF HVY RAIN BY 22-23Z. LEADING EDGE OF LT TO MODERATE RAIN HEADING
INTO SANTA BARBARA BY 22Z AND CONTINUING THRU AT LEAST 00Z THERE.
WILL CONTINUE TO MONITOR...**

G9 MOTOR WINDING OPERATIONS HAVE STARTED FM NOW TIL MARCH 1. MOST OF
DATA FM 0430 TO 1200Z WILL BE MISSING. G8 DATA IS STILL AVLBL DURING
THAT PERIOD....ALONG WITH THE EVENING PASSES OF SSMI MICROWAVE DATA.

SATELLITE ESTIMATE GRAPHIC FOR THE PERIOD 16-19Z ON INTERNET AT THE
ADDRESS BELOW ...OROGRAPHICS INCLUDED

PLEASE SEE HPC QPF DISCUSSIONS AND GRAPHICS FOR DETAILS OF FORECAST
PRECIP AMOUNTS.

<http://www.ssd.noaa.gov/SSD/ML/pcpn-ndx.html>
[ONLINE SSD PRECIPITATION PRODUCT INDEX]



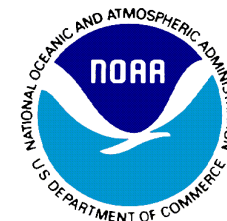
What we have to offer...

- Expertise in microwave remote sensing:

- DMSP SSM/I operational algorithms
 - SSMS Cal/Val Team
- NOAA AMSU operational algorithms & products *Ferraro/Poster*
- EOS-Aqua AMSR Science Team contributions
 - GPROF rain over land; TMI products *McCollum/Poster*
- CMIS instrument team, requirements, etc. [& products]
- GPCP & NCDC climate products

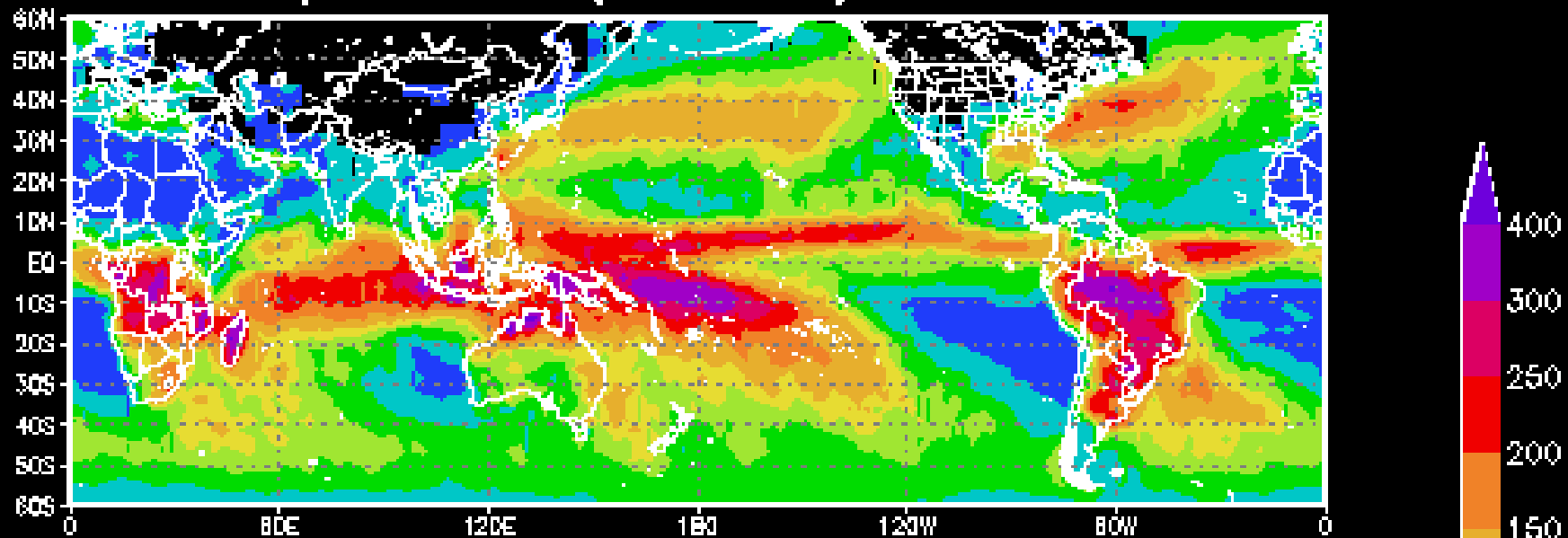
- Expertise in remote sensing of precipitation:

- IR-based techniques for operational use
- Multi-spectral techniques under evaluation

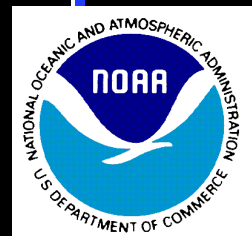
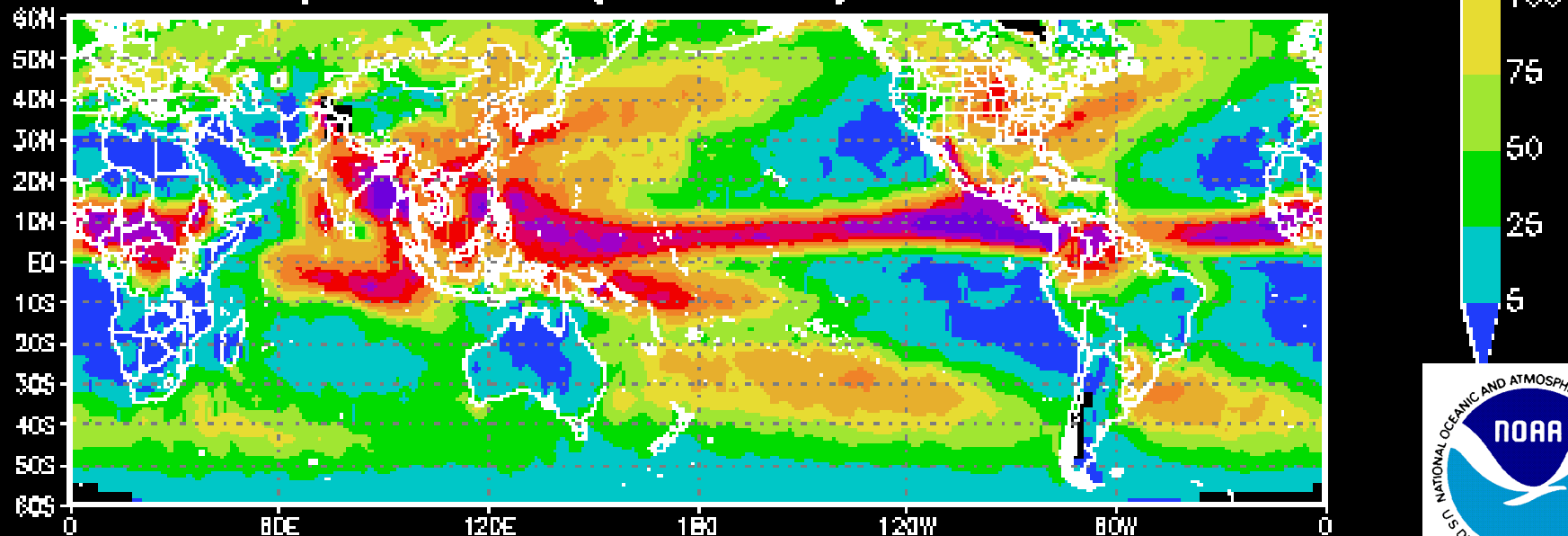


GLOBAL RAINFALL ANALYSIS FROM DMSP SSM/I

SSM/I Rainfall (1987-98) DEC,JAN,FEB



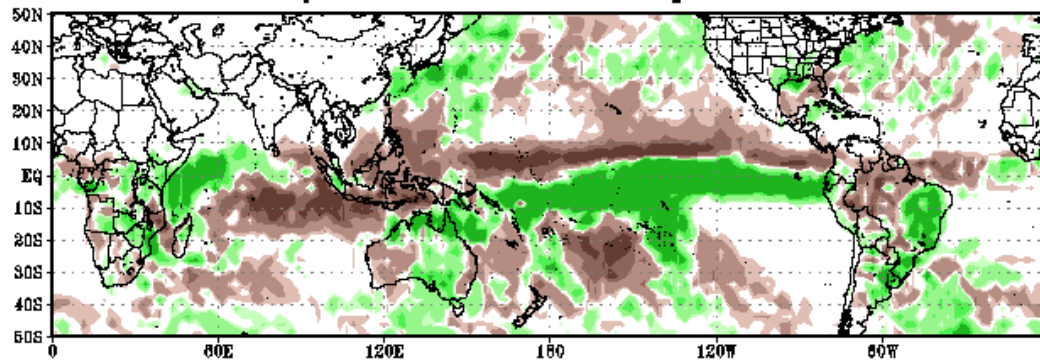
SSM/I Rainfall (1987-98) JUN,JUL,AUG



Monthly Rainfall Anomaly

based on departure from 1987–2000 base period

SSM/I Rainfall Anomaly Jan 1998



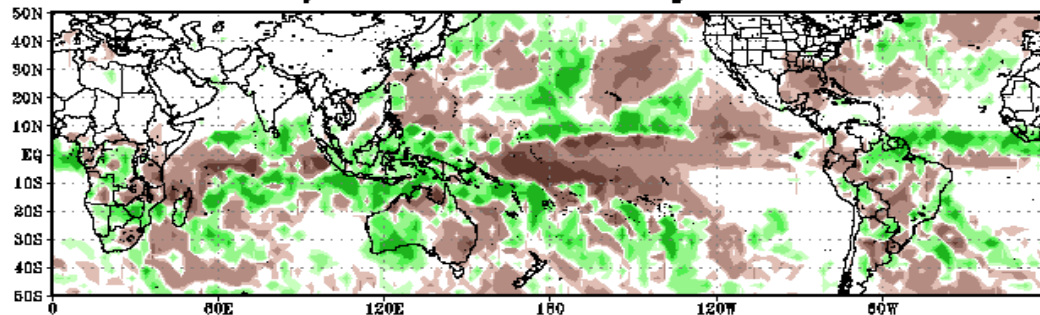
1997-98 El Nino Event

(Warm SST)

Monthly Rainfall Anomaly

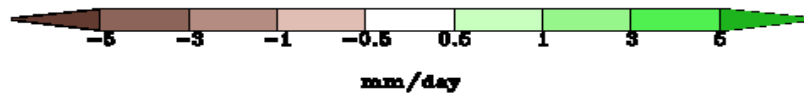
based on departure from 1987–2000 base period

SSM/I Rainfall Anomaly Jan 2000



1999-00 La Nina Event

(Cold SST)

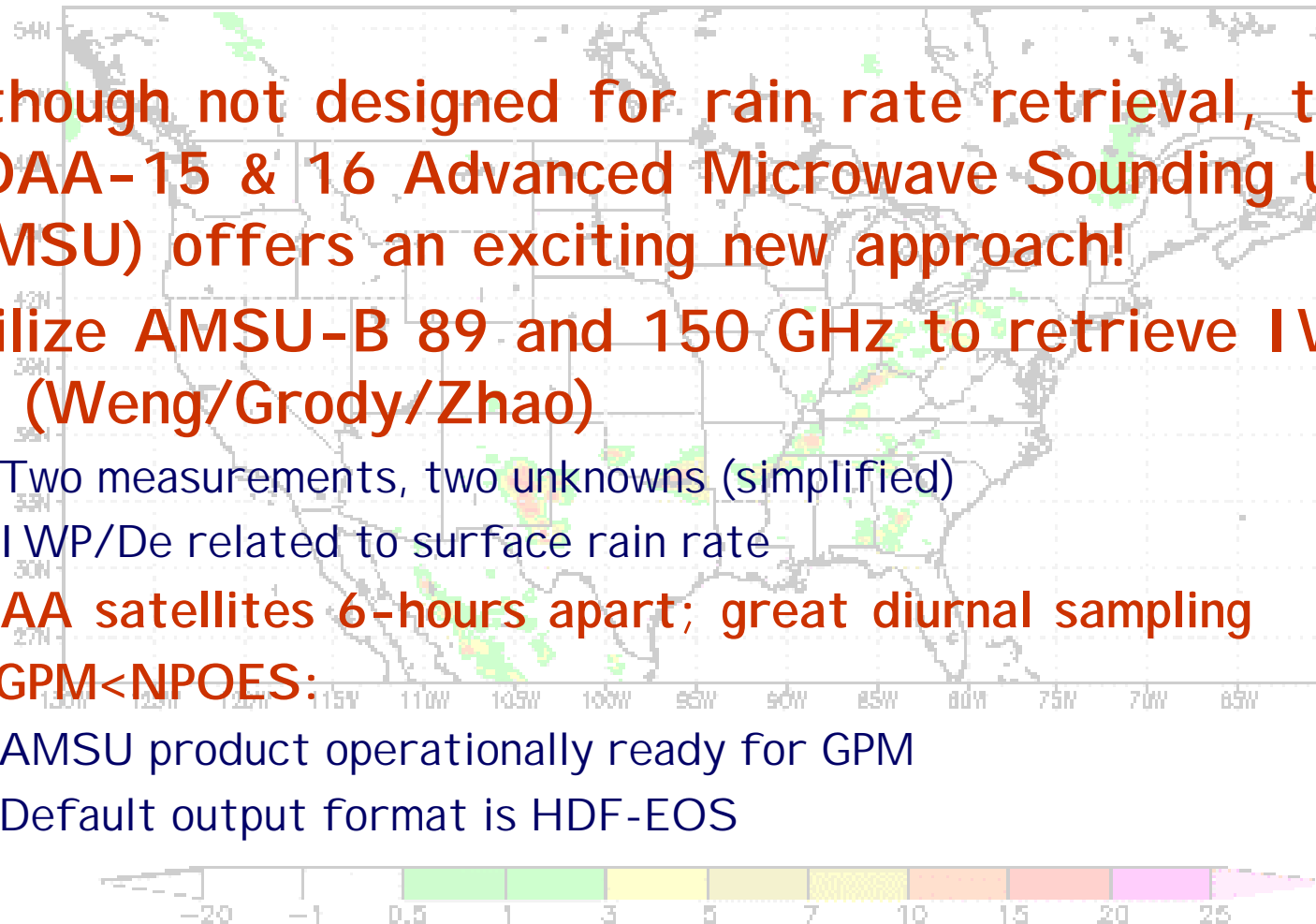


15 Jul 2000 NOAA/NESDIS/ORA/ARAD Hydrology Team



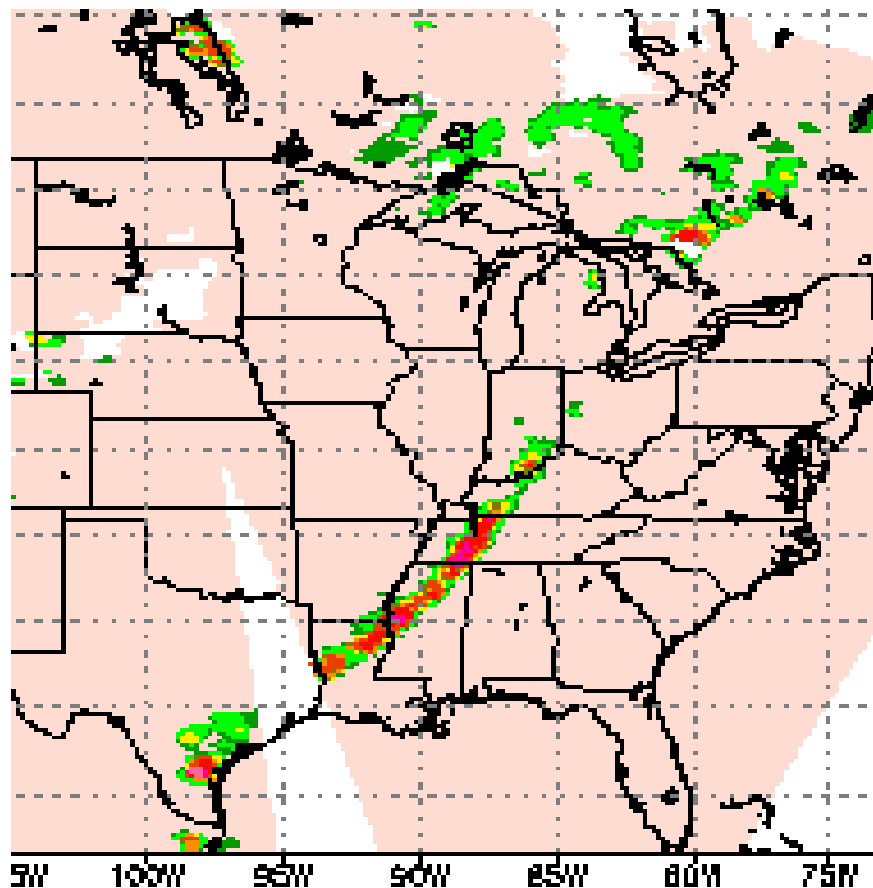
NOAA AMSU Rainfall Algorithm

- Although not designed for rain rate retrieval, the NOAA-15 & 16 Advanced Microwave Sounding Unit (AMSU) offers an exciting new approach!
- Utilize AMSU-B 89 and 150 GHz to retrieve IWP and De (Weng/Grody/Zhao)
 - Two measurements, two unknowns (simplified)
 - IWP/De related to surface rain rate
- NOAA satellites 6-hours apart; great diurnal sampling
- If $GPM < NPOES$:
 - AMSU product operationally ready for GPM
 - Default output format is HDF-EOS

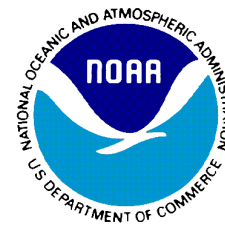
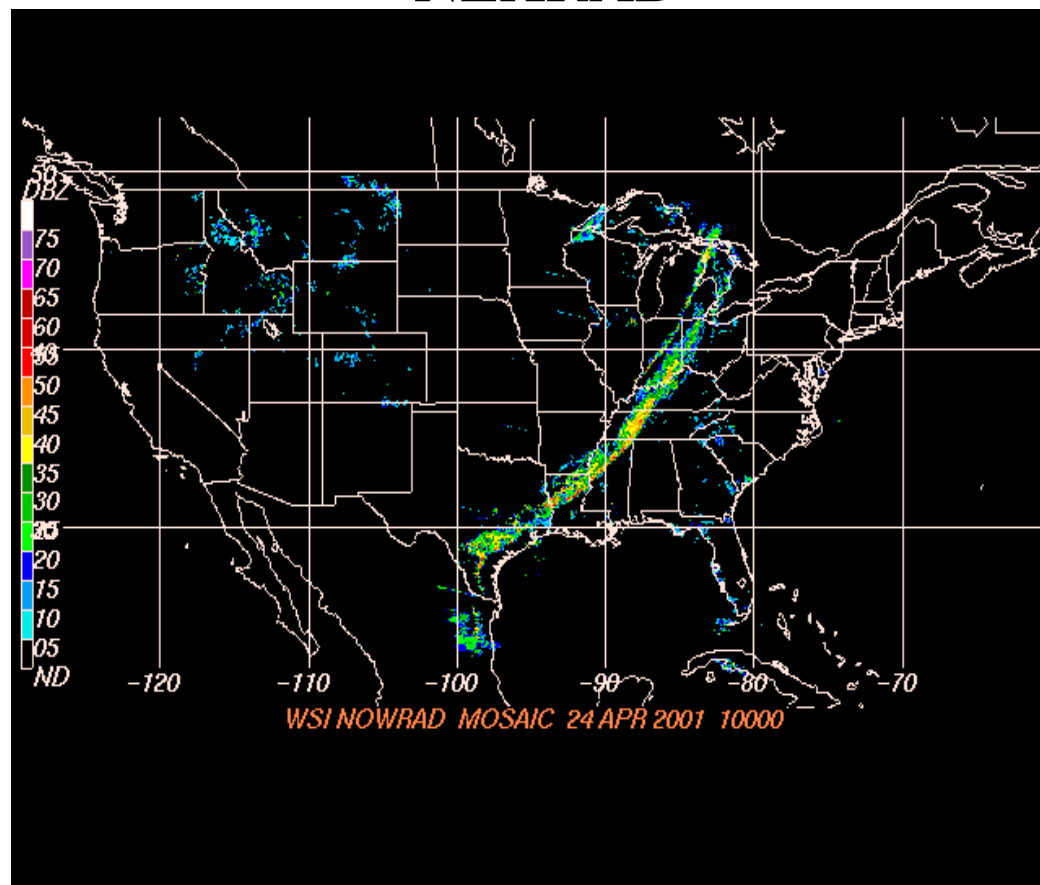


AMSU-B Hourly Rainfall (mm) (N15)

22Z, 04232001 ~ 04Z, 04242001

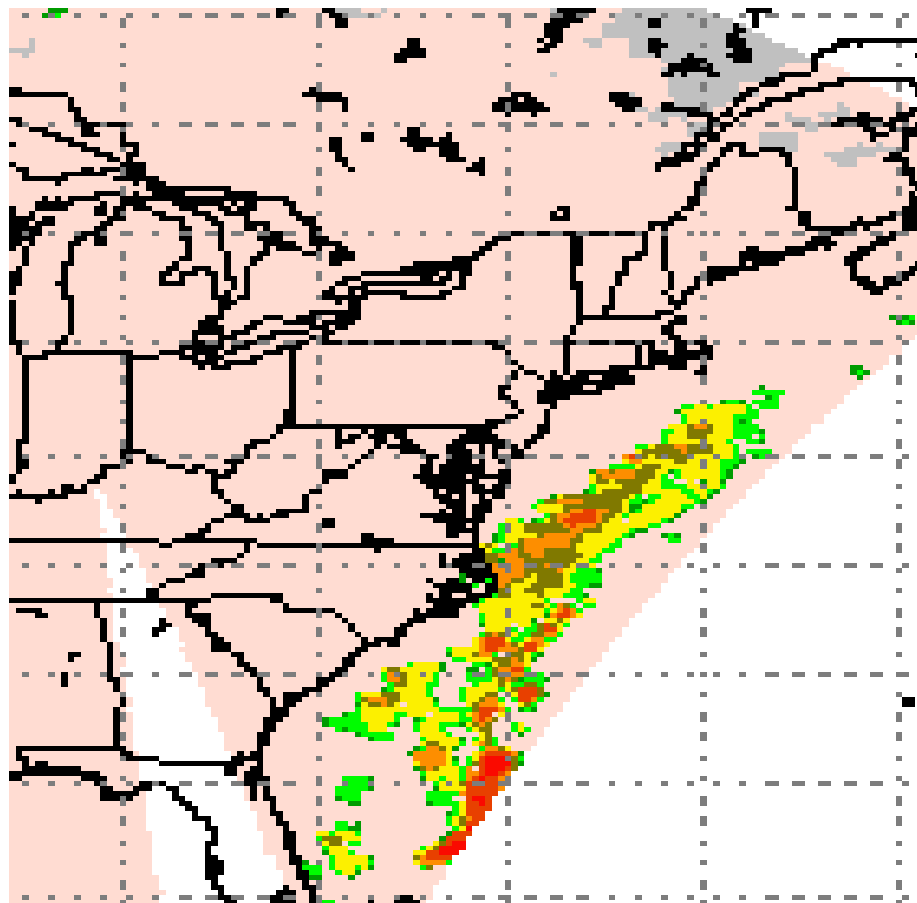


NEXRAD

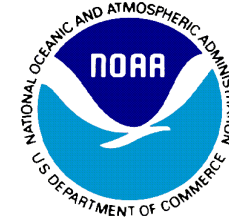
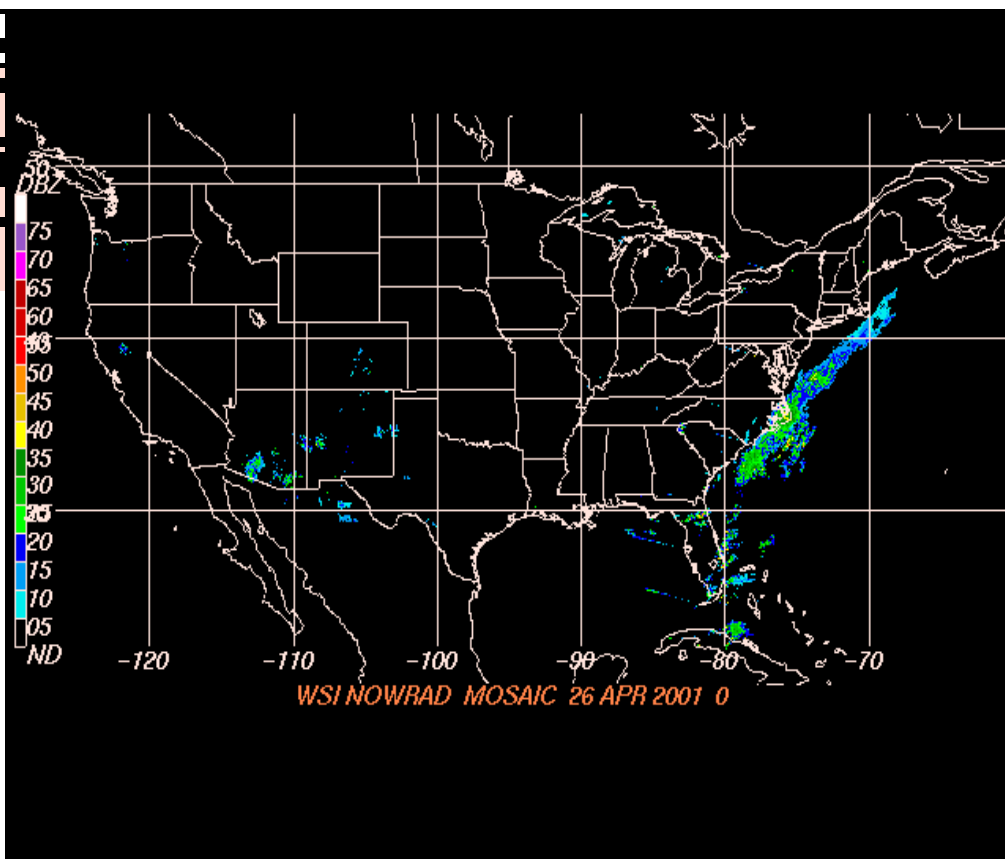


AMSU-B Hourly Rainfall (mm) (N15)

22Z, 04252001 ~ 04Z, 04262001

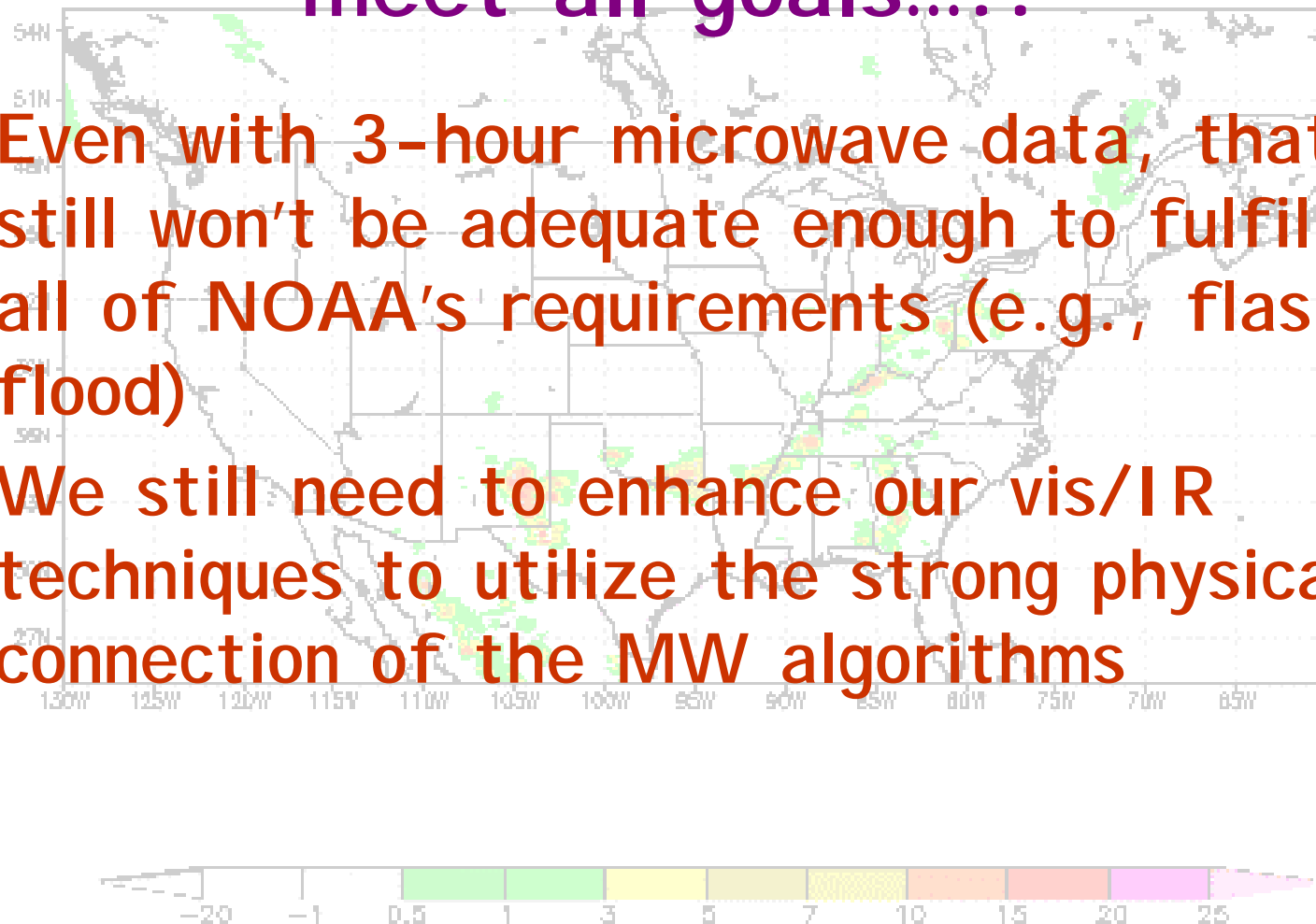


NEXRAD



Still Need a blended technique to meet all goals.....

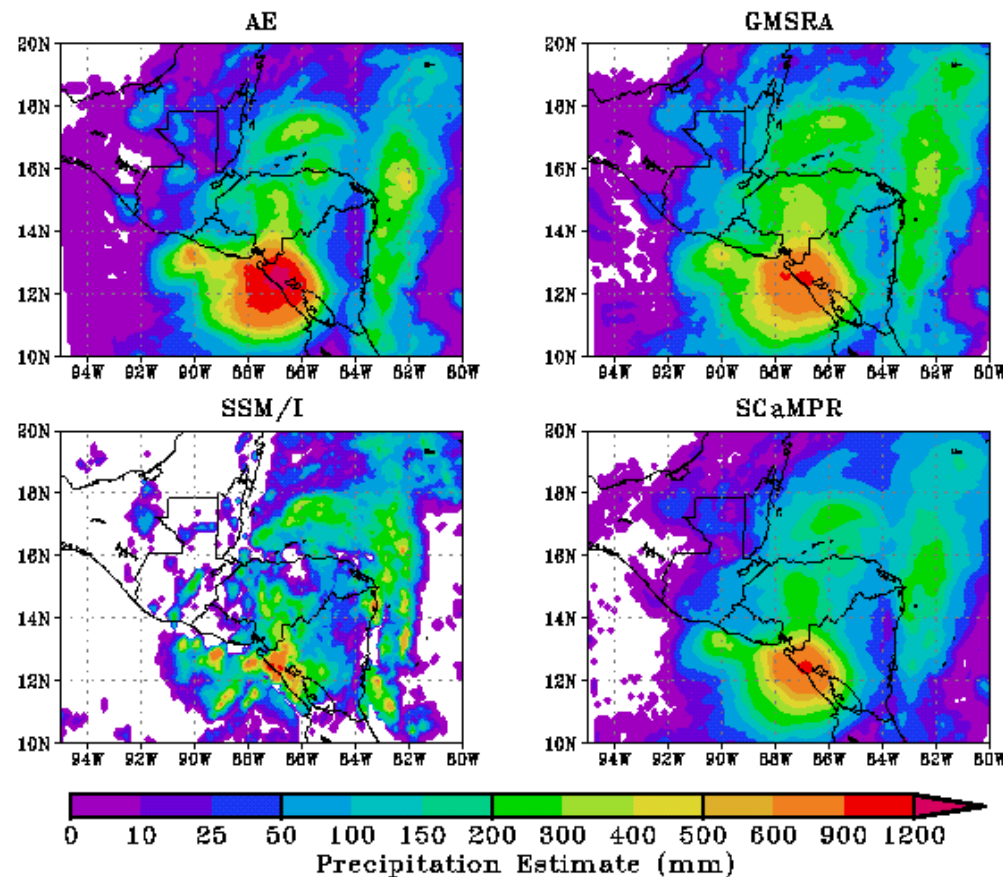
- Even with 3-hour microwave data, that still won't be adequate enough to fulfill all of NOAA's requirements (e.g., flash flood)
- We still need to enhance our vis/IR techniques to utilize the strong physical connection of the MW algorithms



One Example SCaMPR

- Self-Calibrating Multivariate Precipitation Retrieval (R. Kuligowski)
- Dynamically selects from available predictors, including AE and GMSRA rain rate estimates, GOES brightness temperatures, time change and texture of brightness temperature.
- Calibration updated in real time using either SSM/I or Stage III (radar and gauge) precipitation estimates.
- Two main components:
 - Rain/no rain—calibrated by maximizing Heidke Skill Score of target rain area versus various thresholds of predictor fields
 - Rain rate—calibrated using forward screening regression to select and calibrate best predictors.

Estimated 72-h Precipitation Totals for Hurricane Mitch (29–31 October 1998)



Summary

- Documented User Requirements for Atmospheric Moisture
 - Real-time imagery and NWP assimilation
 - GOES and POES/NPOESS instrument developments and requirement assessments
- Expertise in operational product generation:
 - Been doing this for years; NESDIS primary mission
 - End-to-End; from ingest to distribution and archival
- Experience in collaborative efforts:
 - Domestic programs
 - NASA, DOD, Academia,....
 - International programs
 - Visiting scientists
- Robust Technology Transfer
 - NASA/NOAA cooperative agreements (NPP, Joint Center for Sat Data Assimilation,...)
 - non-NOAA R&D platforms in quasi-operational setting

